

REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 9, 10, 12-18, and 21-31 are presently active in this case. Claims 9, 10, 14, and 15 have been amended and Claims 22-31 have been added. Claims 1-8, 11, 19, and 20 have been canceled without prejudice or disclaimer. Care has been taken such that no new matter has been entered. (See, e.g., page 9, lines 15-22, and Figures 1-3 and 5.)

In the outstanding Official Action, Claims 9-17 and 19-21 were rejected under 35 U.S.C. 102(b) as being anticipated by Vincenzo et al. (U.S. Patent No. 6,022,412). Claims 9-21 were rejected under 35 U.S.C. 102(b) as being anticipated by Tadaitso et al. (JP 08-279465). Claims 9-17 and 19-21 were rejected under 35 U.S.C. 102(e) as being anticipated by Kilpela et al. (U.S. App. Pub. No. 2005/0092249). Claim 18 was rejected under 35 U.S.C. 103(a) as being unpatentable over Vincenzo et al. in view of Anderson et al. (U.S. Patent No. 5,916,369). Claim 18 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kilpela et al. in view of Anderson et al. For the reasons discussed below, the Applicants request the withdrawal of the art rejections.

At the outset, the Applicants note that a claim is anticipated only if each and every element as set forth in the claims is found, either expressly or inherently described, in a single prior art reference. As will be demonstrated below, the Vincenzo et al. reference, the Tadaitso et al. reference, and the Kilpela et al. reference clearly do not meet each and every limitation of amended independent Claims 9, 14, and 15.

Independent Claim 9 of the present application recites a processing apparatus comprising, among other features, a chamber, a gas supply section, and an exhaust opening, wherein the chamber has a gas flow passage extending from the gas supply opening to the exhaust opening, and wherein the gas flow passage has a transverse cross-sectional area with

at least a width that decreases in inverse proportion to a distance from the gas supply opening along the gas flow passage. Independent Claim 15 recites a method for processing a substrate comprising, among other features, causing a predetermined gas supplied to flow in a chamber in a manner that the gas flows along a gas flow passage having a transverse cross-sectional area with at least a width that decreases in inverse proportion to a distance from a gas supply opening. The Applicants submit that the Vincenzo et al. reference, the Tadaitso et al. reference, and the Kilpela et al. reference clearly do not disclose all of the above limitations.

The Vincenzo et al. reference describes an epitaxial reactor (10) depicted in Figures 1 and 2 that consists of a reaction chamber (12) in the form of a tubular portion of fairly flat rectangular cross-section and containing a susceptor disc (14) having a plurality of recesses (16a-h) for housing a corresponding plurality (18a-h) of disc-shaped wafers. The reaction chamber (12) has a door (20) for the introduction and removal of semiconductor wafers, a plurality of inlets (22, one of which is shown) for the admission of gaseous reagents, and a pipe (24) for the expulsion of reacted gaseous products. (Column 6, lines 10-25, of the Vincenzo et al. reference.)

As noted above and as is clearly depicted in Figures 1 and 2, the Vincenzo et al. reference describes a reaction chamber (12) with inlets (22) on one end and an outlet pipe (24) on the other end. As can be seen in the cross-section in Figure 1, the chamber (12) has an upper wall that tapers downward from the inlet side to the outlet side. However, as is evident from a review of Figure 2 and the written description in column 6, lines 10-25, the chamber (12) has a flow path therethrough with a transverse cross-section that is in the form of a flat rectangular cross-section (see Figure 2) of constant width. Thus, the Vincenzo et al. reference clearly does not disclose a chamber having a gas flow passage having a transverse cross-sectional area with *at least a width that decreases in inverse proportion to a distance*

from a gas supply opening as recited in Claim 9. Furthermore, the Vincenzo et al. reference clearly does not disclose a method including causing a predetermined gas supplied to flow in a chamber in a manner that the gas flows along a gas flow passage having a transverse cross-sectional area with *at least a width that decreases in inverse proportion to a distance from a gas supply opening* as recited in Claim 15.

Since the Vincenzo et al. reference does not disclose all of the limitations recited in independent Claims 9 and 15, the Applicants respectfully request the withdrawal of the anticipation rejection of Claims 9 and 15 based on the Vincenzo et al. reference.

The Tadaitsu et al. reference describes a flow channel (1) having an upper surface (5) with a plurality of holes for a wafer (2), and a bottom (6) that is curved upward in a flow direction. In paragraph [0019] of the computer translation, the Tadaitsu et al. reference describes that gas is exhausted from an exhaust port (4) through a gas exit cone (3). The Tadaitsu et al. reference indicates that the cross-sectional area of the flow channel (1) tapers off in the flow direction, but the width of the cross-section is described as being fixed in paragraph [0020], as is further evidenced in Figure 1(b) taken along cross-sectional line A-A'.

As noted above and as is clearly depicted in Figure 1(b), the Tadaitsu et al. reference describes a flow channel (1) with a transverse cross-section that is in the form of a rectangle of constant width. Thus, the Tadaitsu et al. reference clearly does not disclose a chamber having a gas flow passage having a transverse cross-sectional area with *at least a width that decreases in inverse proportion to a distance from a gas supply opening* as recited in Claim 9. Furthermore, the Tadaitsu et al. reference clearly does not disclose a method including causing a predetermined gas supplied to flow in a chamber in a manner that the gas flows along a gas flow passage having a transverse cross-sectional area with *at least a width that*

decreases in inverse proportion to a distance from a gas supply opening as recited in Claim 15.

Since the Tadaitu et al. reference does not disclose all of the limitations recited in independent Claims 9 and 15, the Applicants respectfully request the withdrawal of the anticipation rejection of Claims 9 and 15 based on the Tadaitu et al. reference.

The Kilpela et al. reference describes an ALD reactor (50) having a reaction chamber (52) with a wafer or substrate (56) disposed therein. The reaction chamber (52) has a first precursor supply conduit (60), a second precursor supply conduit (62), and an exhaust (66) for removing material from the reactor chamber (52). A showerhead plate (67) is positioned within the reaction chamber (52) and divides a reaction space (54) therein into an upper chamber (68) and a lower chamber (70). The showerhead plate (67) includes a plurality of passages (72) that connect the upper chamber (68) to the lower chamber (70), and controls the flow of the second precursor B therethrough.

Figures 3A and 3B of the Kilpela et al. reference depicts embodiments in which the thickness of the showerhead plate (67) is varied in order to vary the distance between the showerhead plate (67) and the substrate, thereby varying the flow space (s). However, the Kilpela et al. reference never discloses a chamber having a gas flow passage having a transverse cross-sectional area with *at least a width that decreases in inverse proportion to a distance from a gas supply opening* as recited in Claim 9. Furthermore, the Kilpela et al. reference does not disclose a method including causing a predetermined gas supplied to flow in a chamber in a manner that the gas flows along a gas flow passage having a transverse cross-sectional area with *at least a width that decreases in inverse proportion to a distance from a gas supply opening* as recited in Claim 15.

Since the Kilpela et al. reference does not disclose all of the limitations recited in independent Claims 9 and 15, the Applicants respectfully request the withdrawal of the anticipation rejection of Claims 9 and 15 based on the Kilpela et al. reference.

Independent Claim 14 of the present application recites a processing apparatus comprising, among other features, a chamber having a bottom wall configured to support a substrate, a gas supply opening, and an exhaust opening, wherein the chamber has a cross-section that has an approximately triangular shape as seen from a direction approximately perpendicular to the bottom wall. The Applicants submit that the Vincenzo et al. reference, the Tadaitso et al. reference, and the Kilpela et al. reference clearly do not disclose all of the above limitations.

The Vincenzo et al. reference describes a reaction chamber (12) containing a susceptor disc (14) having a plurality of recesses (16a-h) for housing a corresponding plurality (18a-h) of disc-shaped wafers. Column 6, lines 10-25, of the Vincenzo et al. reference, and Figures 1 and 2 clearly describe the reaction chamber (12) as having a flow path therethrough with a transverse cross-section that is in the form of a flat rectangular cross-section of constant width. Thus, despite the fact that a plan view of the reaction chamber (12) is not depicted in the Vincenzo et al. reference, the Figures 1 and 2 thereof and the written description of the reaction chamber (12) clearly indicate that the cross-section of the reaction chamber (12) as seen from a direction approximately perpendicular to a bottom wall thereof configured to support the wafer therein has a rectangular shape. Therefore, the Vincenzo et al. reference does not disclose a chamber having a cross-section that has an approximately triangular shape as seen from a direction approximately perpendicular to a bottom wall, as recited in Claim 14.

Since the Vincenzo et al. reference does not disclose all of the limitations recited in independent Claim 14, the Applicants respectfully request the withdrawal of the anticipation rejection of Claim 14 based on the Vincenzo et al. reference.

As noted above, the Tadaitsu et al. reference indicates that the cross-sectional area of the flow channel (1) tapers off in the flow direction, but the width of the cross-section is described as being fixed in paragraph [0020], as is further evidenced in Figure 1(b) taken along cross-sectional line A-A which clearly depicts a flow channel (1) with a transverse cross-section that is in the form of a rectangle of constant width. Thus, despite the fact that a plan view of the flow channel (1) is not depicted in the Tadaitsu et al. reference, the Figures 1(a) and 1(b) and the written description clearly indicate that the cross-section of the flow channel (1) as seen from a direction approximately perpendicular to a bottom wall has a rectangular shape. Therefore, the Tadaitsu et al. reference does not disclose a chamber having a cross-section that has an approximately triangular shape as seen from a direction approximately perpendicular to a bottom wall, as recited in Claim 14.

Since the Tadaitsu et al. reference does not disclose all of the limitations recited in independent Claim 14, the Applicants respectfully request the withdrawal of the anticipation rejection of Claim 14 based on the Tadaitsu et al. reference.

The Kilpela et al. reference describes an ALD reactor (50) having a reaction chamber (52) with a wafer or substrate (56) disposed therein. Figures 3A and 3B of the Kilpela et al. reference depicts embodiments in which the thickness of the showerhead plate (67) is varied in order to vary the distance between the showerhead plate (67) and the substrate, thereby varying the flow space (s). However, the Kilpela et al. reference never discloses varying the width of the reaction chamber (52). Thus, despite the fact that a plan view of the reaction chamber (52) is not depicted in the Kilpela et al. reference, the Applicants submit that the

reference suggests that the cross-section of the reaction chamber (52) as seen from a direction approximately perpendicular to a bottom wall supporting the wafer or substrate (56) has a rectangular shape. Therefore, the Kilpela et al. reference does not disclose a chamber having a cross-section that has an approximately triangular shape as seen from a direction approximately perpendicular to a bottom wall, as recited in Claim 14.

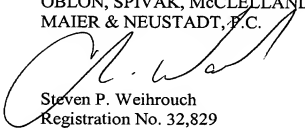
Since the Kilpela et al. reference does not disclose all of the limitations recited in independent Claim 14, the Applicants respectfully request the withdrawal of the anticipation rejection of Claim 14 based on the Kilpela et al. reference.

The dependent claims are considered allowable for the reasons advanced for the independent claim from which they respectively depend. These claims are further considered allowable as they recite other features of the invention that are neither disclosed nor suggested by the applied references when those features are considered within the context of their respective independent claim.

Consequently, in view of the above discussion, it is respectfully submitted that the present application is in condition for formal allowance and an early and favorable reconsideration of this application is therefore requested.

Respectfully Submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Steven P. Weihrouh
Registration No. 32,829
Attorney of Record

Christopher D. Ward
Registration No. 41,367



22850

Customer Number 22850
Tel. (703) 413-3000
Fax. (703) 413-2220
(OSMMN 10/01)

SPW:CDW:mca